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LOSSES ATTRIBUTABLE TO THE JACK-PINE BUDWORM DURING THE 1955-1957 OUTBREAK IN WISCONSIN 1/

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The jack-pine budworm, Choristoneura pinus Freeman, has been a major defoliator of jack pine forests throughout the Lake States for the past quarter century. Losses to the budworm have been variable; in some instances reduced growth has reflected the impact of the defoliation, whereas in a few localized areas, substantial tree mortality has occurred. (Univ. Wis. For. Res. Notes 20, 29, 42).

In Wisconsin, the most recent outbreak of the budworm persisted from 1955 through 1957. Three major epicenters were involved. These included approximately 8,900 acres of natural and plantation stands in Marinette County, 9,000 acres in Oneida County, and several hundred thousand acres in Bayfield, Burnett, Douglas, Polk and Washburn Counties.

Losses in merchantable and non-merchantable classes of jack pine attributable to budworm defoliation were assessed and will be reported here. It is hoped that these findings will assist forest managers to evaluate their local situation and guide them in handling the budworm during its current resurgence.

The budworm status will be discussed briefly as to the general intensity of defoliation and duration, and the impact of defoliation. The impact of defoliation was observed during the periodic examination of a series of 1/5 acre circular plots established at random in each county. The final examination of 101 study plots was in the fall of 1958.

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When considering information relative to tree mortality, certain limitations must be recognized. First, routine cutting operations continued in most areas during the outbreak, and in some instances budworm damaged stands were salvage-cut. Data concerning the volume and number of budworm-killed trees on plots within these areas were not available, hence, they could not be incorporated into the evaluation. Not all budworm-damaged stands were included in the salvage, so, in general, mortality in nonsprayed forests must be considered minimal.

Budworm defoliation was widespread but spotty in the Northwestern counties (Bayfield, Burnett, Douglas and Polk) in 1956 and 1957. Stands requiring treatment were sprayed in 1956 or 1957; stands in which budworm populations were low in 1956 or in which they collapsed in 1957, were, of course, not treated. Thus, here again, mortality estimates for the outbreak must be considered on the low side.

Marinette County

The budworm was in outbreak in northeastern Wisconsin over approximately 8,900 acres of pole-sized natural stands and jack pine plantations in 1954 and 1955. Insecticidal controls were not applied and no obvious defoliation occurred from 1956 through 1958 when 13 of the original 15 plots were evaluated. In 5 plantations averaging 0.98 cords, 218 four-inch and 878 two-inch saplings per acre, tree mortality averaged 0.5 and 1.4 percent in the four-and two-inch-diameter classes respectively. No mortality occurred among merchantable stocking, while an approximate net increase in reproduction from 120 to 440 stems per acre or about 265 percent occurred. In 8 natural stands averaging 4.45 cords, 95 four- and 106 two-inch saplings per acre, tree mortality was 2 (0.07 cords per acre), 6 and 15 percent respectively. A mean reduction in reproduction from 1031 to 994 occurred. Losses among the four- and two-inch classes occurred mainly on the lower intermediate and suppressed classes.

Oneida County

The outbreak in Oneida County reached its peak in 1956 and 1957 on approximately 9,000 acres of natural jack pine forest. When severe damage appeared imminent, DDT sprays were applied in 1957 to 7,400 acres to reduce the budworm population which, incidentally, remained low since. Study plots established in 5 non-sprayed and 7 sprayed stands were examined for tree mortality. In the unsprayed forests, which averaged 8.60 cords, 20 four-inch and 16 two-inch saplings per acre, tree mortality was 0, 20 and 25 percent respectively. In the sprayed forests, which averaged 10.70 cords 37 four-inch and 24 two-inch saplings per acre, mortality averaged 0.8 (0.1 cords), 22 and 12 percent. Tree mortality was limited in general to trees in the lower intermediate and suppressed crown classes. Reproduction was essentially absent. Top killed trees that ultimately died were salvaged.

Bayfield County

Budworm defoliation in Bayfield County became evident in 1956, reached its peak in 1957, then declined. None of the study areas were sprayed during the 3,100 acre control program but 4 of the 12 plots were cut. On the remainder, the stands averaged 6.20 cords, 293 four-inch, 175 two-inch and 6 reproduction stems per acre. A negligible (0.3 percent) mortality among four-inch saplings was observed; other tree classes escaped mortality.

Burnett County

Severe defoliation occurred in Burnett County in 1956 and 1957 and in 1958 the population collapsed. Twenty-two study plots were established, sixteen remained for evaluation and three of these had budworm population in 1957 that required spraying during the 6,640 acre program. The unsprayed stands, all natural, averaged 7.78 cords, 147 four-inch and 88 two-inch stems per acre. Mortality averaged 0.5, 7, and 2 percent respectively in these classes. Reproduction losses averaged 92 percent. Mortality in 3 sprayed natural stands, averaging 5.26 cords, 228 four-inch and 383 two-inch stems per acre was zero, 17 and 6 percent respectively. Reproduction increased 4 percent to 500 stems per acre. No mortality occurred in the plot established in the plantation.

Douglas County

The budworm population increased in Douglas County during 1954 and 1955, and reached outbreak status in 1956 and 1957. Approximately 21,690 acres of heavily infested jack pine required treatment with insecticides in 1956 and 2,900 in 1957. The population was greatly reduced following treatment, but erupted locally in 1960. Sixty-one plots were established to evaluate the impact of the budworm defoliation. Of twenty-five plots that were uncut at the time of evaluation in 1958, three had been treated with insecticide. In the unsprayed stands averaging 4.72 cords, 141 four-inch, 114 two-inch and 1263 reproduction stems per acre, mortality was 8 (0.36 cords), 10, 17, and 64 percent respectively. On three sprayed plots averaging 1.66 cords, 200 four-inch, 310 two-inch, and 666 reproduction stems per acre, mortality was 9, 16, and 15 percent in the four-inch, two-inch, and reproduction classes. No tree mortality was observed among merchantable trees.

Polk County

Severe defoliation in Polk County took place in 1956 and 1957, but by 1958 the peak had passed. During 1957, however, it was necessary to resort to DDT sprays to reduce defoliation on 4,290 acres. Of ten study plots established, three were sprayed, one was cut and the remainder evaluated. Non-sprayed stands averaged 9.63 cords, 146 four-inch and 69 two-inch stems per acre. Mortality was confined to the four-inch (2 percent) and two-inch (1 percent) classes. Reproduction class losses averaged 57 percent. In the sprayed stands which averaged 11.90 cords per acre, and 146 four-inch and 15 two-inch saplings, mortality was 8 (1.0 cords) 2 and 20 percent respectively. Reproduction suffered a 40 percent reduction (133 stems per acre).

Washburn County

In Washburn County, the budworm outbreak began in 1954 and severe defoliation was evident through 1956. No insecticidal controls were applied and by 1958 the population was low. Although larvae could be collected with ease, during the latter two years, no visible defoliation resulted. In 1960, the budworm population began to increase and light to moderate defoliation appeared. At the end of the 1958 season, 14 of the original 20 study plots were examined. These stands averaged 8.83 cords, 205 four-inch, 140 two-inch and 311 reproduction stems per acre. Mortality was 3 (0.27 cords), 21 and 50 percent respectively. Among the reproduction, a 35 percent reduction occurred. Here, as in the preceding areas, losses were concentrated among the intermediate and suppressed crown classes.

Conclusions

Jack-pine-budworm-caused mortality in the jack pine forests of the Lake States has been variable. In some instances, the impression is that entire forests succumb. Generally, however, mortality in well stocked, merchantable stands is low, although poorly stocked forests may sustain losses considered economically significant. During the recent budworm epidemic in Wisconsin, mortality of merchantable trees varied from less than 1 percent to 8 percent; in most areas losses per acre averaged from 0.04 to 0.36 cords per acre. The most severe impact was sustained in the 4- and 2-inch classes where up to 50 percent mortality occurred; tree killing was most frequently restricted to suppressed trees doomed to succumb early in the rotation. Reproduction in poorly stocked stands sustained a variable impact; in some stands mortality reached 90 percent, yet in other similar stands a gain was experienced. In summary, it would appear that the major mortality caused by the budworm is among the suppressed and intermediate 4- and 2-inch reproduction classes. In poorly stocked stands, mortality among merchantable trees may be locally high. In general, however, losses will range from 1 to 8 percent.

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